

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strike through~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please AMEND claims 1-6, 8-24, 26-32, 34-37, 42-44, 46-54 and 56-61, and CANCEL claims 7, 25, 33, 38-41, 45 and 55 in accordance with the following:

1. (CURRENTLY AMENDED) A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, said method comprising ~~the steps of~~:
 - (a) ~~creating~~ a basic pattern shape of ~~the~~ a prospective binary-coding pattern by a first arithmetic operation;
 - (b) ~~determining the~~ a sequence of lighting pixels composing such basic pattern by a second arithmetic operation; and
 - (c) ~~creating~~ a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern, and
where said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each last-named pixel.
2. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 1, wherein, ~~in said step (c)~~, said rectangular pattern is created by a third arithmetic operation.
3. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 1, wherein ~~said step (a)~~ creating the basic pattern includes ~~the steps of~~:
 - (a-1) ~~designating~~ a pattern angle through which said binary-coding pattern is turned;
 - (a-2) ~~designating the~~ a number of pixels composing said basic pattern; and
 - (a-3) ~~executing an arithmetic operation based on said pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).~~
4. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 2, wherein ~~said step (a)~~ creating the basic pattern includes ~~the steps of~~:

~~(a-1)~~ designating a pattern angle through which said binary-coding pattern is turned;
~~(a-2)~~ designating ~~the a~~ number of pixels composing said basic pattern; and
~~(a-3)~~ executing an arithmetic operation based on said pattern angle designated ~~in said~~
~~step (a-1)~~ and said number of pixels designated ~~in said step (a-2)~~.

5. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 3, wherein, ~~in said step (a),~~ when creating the basic pattern,

one or more rectangles are created which have the following corner points: point A(c, 1); point B (a+c, b+1); point C (0, d+1); and point D(a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels, which is designated ~~in said step (a-2)~~, and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated ~~in said step (a-1)~~, is selected as said basic pattern.

6. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 4, wherein, ~~in said step (a),~~ when creating the basic pattern,

one or more rectangles are created which have the following corner points: point A (c, 1); point B (a+c, b+1); point C (0, d+1); and point D (a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels, ~~which~~
is designated ~~in said step (a-2)~~, and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated ~~in said step (a-1)~~, is selected as said basic pattern.

7. (CANCELLED)

8. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 6, wherein, ~~in said step (b),~~ said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

9. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 7~~1~~, wherein, ~~in said step (b),~~ said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a

predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

10. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 8, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

11. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 7~~1~~, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

12. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 8, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

13. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 9, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

14. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 10, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

15. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 1, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a weight which has been assigned to each of the pixels by an arithmetic operation according to a distance between a predetermined point in said basic pattern and each of the

last-named pixels.

16. (CURRENTLY AMENDED) ~~A-~~The method of creating a binary-coding pattern according to claim 1, wherein, ~~in said step (e),~~ said rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

17. (CURRENTLY AMENDED) ~~A-~~The method of creating a binary-coding pattern according to claim 16, wherein, ~~in said step (e),~~ a motif-pattern showing a distinctive characteristic of said rectangular pattern is cut from said rectangular pattern to represent said rectangular pattern.

18. (CURRENTLY AMENDED) ~~A-~~The method of creating a binary-coding pattern according to claim 17, wherein:

said motif-pattern occupies a rectangular area that is measured Y in the primary scanning direction by i in the secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing the basic pattern ~~in said step (b)~~.

19. (CURRENTLY AMENDED) ~~A-~~The method of creating a binary-coding pattern according to claim 5, wherein, ~~in said step (e),~~ said rectangular pattern is created by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$\text{size}(X) = \max((n \div \gcd(b, n)), (n \div \gcd(d, n)))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$\text{size}(Y) = \max((n \div \gcd(a, n)), (n \div \gcd(c, n)))$$

20. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 6, wherein, ~~in said step (c)~~, said rectangular pattern is created by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size(X) = \max((n \div \gcd(b, n), (n \div \gcd(d, n)))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size(Y) = \max((n \div \gcd(a, n), (n \div \gcd(c, n)))$$

21. (CURRENTLY AMENDED) A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, ~~said method~~ said method comprising the steps of:

- (a) creating a basic pattern shape of the a prospective binary-coding pattern by a first arithmetic operation;
- (b) determining the a sequence of lighting pixels composing such basic pattern; and
- (c) creating a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern, and
where said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each last-named pixel.

22. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 21, wherein, ~~in said step (c)~~, said rectangular pattern is created by a second arithmetic operation.

23. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 21, wherein ~~said step (a) includes the steps of~~ creating the basic pattern includes:

- (a-1) designating a pattern angle through which said binary-coding pattern is turned;
- (a-2) designating the a number of pixels composing said basic pattern; and
- (a-3) executing an arithmetic operation based on said pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).

24. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 23, wherein, ~~in said step (a)~~, when creating the basic pattern

one or more rectangles are created which have the following corner points: point A (c, 1); point B (a+c, b+1); point C (0, d+1); and point D (a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels, which is designated in said step (a-2), and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated in said step (a-1), is selected as said basic pattern.

25. (CANCELLED)

26. (CURRENTLY AMENDED) ~~A~~The method of creating a binary-coding pattern according to claim 25~~21~~, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

27. (CURRENTLY AMENDED) ~~A~~The method of creating a binary-coding pattern according to claim 25~~21~~, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

28. (CURRENTLY AMENDED) ~~A~~The method of creating a binary-coding pattern according to claim 21, wherein, ~~in said step (e)~~, said rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

29. (CURRENTLY AMENDED) A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, ~~said method~~ said method comprising the steps of:

- (a) creating a basic pattern shape of the a prospective binary-coding pattern;
- (b) ~~determining the a~~ sequence of lighting pixels composing such basic pattern by a first arithmetic operation; and
- (c) creating a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern, and

where said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each last-named pixel.

30. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 29, wherein, ~~in said step (c),~~ said rectangular pattern is created by a second arithmetic operation.

31. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 29, wherein creating the basic pattern ~~said step (a)~~ includes the steps of:
(a-1) designating a pattern angle through which said binary-coding pattern is turned;
(a-2) designating ~~the~~ a number of pixels composing said basic pattern; and
(a-3) executing an arithmetic operation based on said pattern angle designated ~~in said step (a-1)~~ and said number of pixels designated ~~in said step (a-2)~~.

32. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim 31, wherein, ~~in said step (a),~~ when creating the basic pattern one or more rectangles are created which have the following corner points: point A (c, 1); point B (a+c, b+1); point C (0, d+1); and point D (a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels, which is designated ~~in said step (a-2)~~, and
the one, out of such rectangles, which is at an angle approximate to said pattern angle designated ~~in said step (a-1)~~, is selected as said basic pattern.

33. (CANCELLED)

34. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim ~~33~~29, wherein, ~~in said step (b),~~ said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

35. (CURRENTLY AMENDED) A The method of creating a binary-coding pattern according to claim ~~33~~29, wherein, ~~in said step (b),~~ said sequence of lighting the pixels is

determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

36. (CURRENTLY AMENDED) ~~A~~The method of creating a binary-coding pattern according to claim 29, wherein, ~~in said step (b)~~, said sequence of lighting the pixels is determined based on a weight which has been assigned to each of the pixels by an arithmetic operation according to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

37. (CURRENTLY AMENDED L) ~~A~~The method of creating a binary-coding pattern according to claim 29, wherein, ~~in said step (c)~~, said rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

38-41. (CANCELLED)

42. (CURRENTLY AMENDED) An apparatus for creating a binary-coding pattern to be used in binary-coding a multi-value image, said apparatus comprising:

a basic pattern shape creating section for creating a basic pattern shape of the prospective binary-coding pattern by a first arithmetic operation;

a lighting sequence determining section for determining the sequence of lighting pixels composing such basic pattern by a second arithmetic operation; and

a rectangular pattern creating section for creating a rectangular pattern, which serves as the prospective binary-coding pattern, by a third arithmetic operation based on the resultant basic pattern, and

where said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each last-named pixel.

43. (CURRENTLY AMENDED) ~~A~~The apparatus for creating a binary-coding pattern according to claim 42, wherein said basic pattern shape creating section includes:

an angle designating section for designating a pattern angle through which the prospective binary-coding pattern is turned;

a number-of-pixels designating section for designating the number of pixels composing said basic pattern; and

an arithmetic section for executing an arithmetic operation based on said pattern angle designated by said angle designating section and said number of pixels designated by said number-of-pixels designating section.

44. (CURRENTLY AMENDED) ~~An~~The apparatus for creating a binary-coding pattern according to claim 43, wherein:

said basic pattern shape creating section creates one or more rectangles which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1); and point D(a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels which is designated by said number-of-pixels designating section, and

out of such rectangles, said basic pattern shape creating section selects the one which is at an angle approximate to said pattern angle designated by said number-of-pixels designating section, as said basic pattern.

45. (CANCELLED)

46. (CURRENTLY AMENDED) ~~An~~The apparatus for creating a binary-coding pattern according to claim ~~45~~42, wherein said lighting sequence determining section determines said sequence of lighting the pixels in such a manner that the pixels are lighted successively from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

47. (CURRENTLY AMENDED) ~~An~~The apparatus for creating a binary-coding pattern according to claim ~~45~~42, wherein said lighting sequence determining section determines said sequence of lighting the pixels based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

48. (CURRENTLY AMENDED) ~~An~~The apparatus for creating a binary-coding pattern according to claim 42, wherein said rectangular pattern creating section cuts such rectangular pattern in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image

scanning direction.

49. (CURRENTLY AMENDED) ~~A~~The apparatus for creating a binary-coding pattern according to claim 48, wherein said rectangular pattern creating section cuts a motif-pattern, which shows a distinctive characteristic of the rectangular pattern, from said rectangular pattern as a representative of said rectangular pattern.

50. (CURRENTLY AMENDED) ~~A~~The apparatus for creating a binary-coding pattern according to claim 49, wherein:

said motif-pattern occupies a rectangular area that is measured Y in a primary scanning direction by i in a secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing said basic pattern.

51. (CURRENTLY AMENDED) ~~A~~The apparatus for creating a binary-coding pattern according to claim 44, wherein said rectangular pattern creating section creates said rectangular pattern by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$\text{size}(X) = \max((n \div \gcd(b, n)), (n \div \gcd(d, n)))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$\text{size}(Y) = \max((n \div \gcd(a, n)), (n \div \gcd(c, n)))$$

52. (CURRENTLY AMENDED) A computer-readable recording medium which stores a binary-coding pattern creating program for creating a binary-coding pattern to be used in binary-coding a multi-value image, wherein said program instructs a computer to ~~function as the following execute operations, said operations comprising:~~

~~(a) a basic pattern shape creating section for creating a basic pattern shape of the a~~ prospective binary-coding pattern by a first arithmetic operation;

~~(b) a lighting sequence determining section for determining the a sequence of lighting~~
pixels composing such basic pattern by a second arithmetic operation; and

~~(c) a rectangular pattern creating section for creating a rectangular pattern, which serves~~
as the prospective binary-coding pattern, by a third arithmetic operation based on the resultant
basic pattern, and

where said sequence of lighting the pixels is determined based on a distance between a
predetermined point in said basic pattern and each last-named pixel.

53. (CURRENTLY AMENDED) A The computer-readable recording medium according
to claim 52, wherein ~~said creating basic pattern shape creating section~~ includes:

~~an angle designating section for designating a pattern angle through which the~~
prospective binary-coding pattern is turned;

~~a number of pixels designating section for designating the number of pixels composing~~
said basic pattern; and

~~an arithmetic section for executing an arithmetic operation based on said pattern angle~~
designated by ~~said angle designating section~~ and said number of pixels designated by ~~said~~
~~number of pixels designating section.~~

54. (CURRENTLY AMENDED) A The computer-readable recording medium according
to claim 53, wherein:

when creating said basic pattern shape creating section creates, one or more rectangles
are created which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0,
d+1); and point D(a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an
equation of $n = ad + bc$, where n is the number of pixels which is designated by said number-
of-pixels designating section, and

out of such rectangles, ~~said basic pattern shape creating section selects~~ the one which is
at an angle approximate to said pattern angle designated by ~~said number of pixels designating~~
section, is selected as said basic pattern.

55. (CANCELLED)

56. (CURRENTLY AMENDED) A The computer-readable recording medium according
to claim ~~55~~52, wherein ~~said lighting sequence determining section determines said sequence of~~

lighting the pixels is determined in such a manner that the pixels are lighted successively from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

57. (CURRENTLY AMENDED) A The computer-readable recording medium according to claim 55, wherein ~~said lighting sequence determining section determines~~ said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

58. (CURRENTLY AMENDED) A The computer-readable recording medium according to claim 52, wherein said rectangular pattern ~~creating section cuts such~~ is created by cutting a rectangular pattern in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

59. (CURRENTLY AMENDED) A The computer-readable recording medium according to claim 58, wherein ~~said rectangular pattern creating section cuts a~~ motif-pattern, which shows a distinctive characteristic of said rectangular pattern, is cut from said rectangular pattern as a representative of said rectangular pattern.

60. (CURRENTLY AMENDED) A The computer-readable recording medium according to claim 59, wherein:

said motif-pattern occupies a rectangular area that is measured Y in a primary scanning direction by i in a secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing said basic pattern.

61. (CURRENTLY AMENDED) A The computer-readable recording medium according to claim 54, wherein:

~~said rectangular pattern creating section creates~~ said rectangular pattern is created by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size(X) = \max((n \div \gcd(b, n)), (n \div \gcd(d, n)))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size(Y) = \max((n \div \gcd(a, n)), (n \div \gcd(c, n)))$$